From: Ian Robinson <ianr@rushingco.com>
Sent: Friday, March 11, 2022 4:25 PM
To: DES SBCC <sbcc@des.wa.gov>
Subject: 2021 WSEC - Comments

External Email

Hello,

I would like to submit a comment regarding the carbon emissions factor used in the code for Natural Gas. The gas carbon emissions factor accounts only for emissions at the point of use (assuming complete, clean combustion) and does not account for any upstream impact in the process of natural gas production. A revised carbon factor for natural gas likely would require revisions to the building performance factors and energy performance factors.

Please see proposed revisions attached, and justification for the revised carbon factor below.

A Carbon Emissions Factor of 11.7 lb/therm for natural gas represents only the point-of-use CO2 emissions of complete combustion of natural gas. It does not include any of the carbon emissions associated with production, transmission, leakage, or incomplete combustion of natural gas, and is therefore a vast underestimate of the climate impact of natural gas energy use. The warming effect of fugitive emissions of natural gas during production and distribution is of particular concern, due to the high global warming potential of Methane as a greenhouse gas. Methane has a 20-year global warming potential of 84.0. The 2011 EPA greenhouse gas inventory placed the US natural gas leakage rate at 2.4% from well to city, according to analysis published in the Proceedings of the National Academy of Sciences (Greater focus needed on methane leakage from natural gas infrastructure | PNAS), and recent studies from the Environmental Defense Fund indicate that methane emissions from the US oil and gas industry may be 60% higher than EPA estimates (Major studies reveal 60% more methane emissions | Environmental Defense Fund (edf.org)). Using this 2.4% estimate and the 20-year GWP of methane to reflect the urgency of the climate emergency, a more appropriate carbon emissions factor for natural gas would be 19.0 lbm CO2e/Therm. Using the 80-year GWP of methane would reduce the impact of fugitive emissions, however given the urgency of the climate crisis the 20-year GWP seems more appropriate.

Location	Item	Value	Units	Source
On-Site	Emissions from Natural Gas Combust	11.7	lbm CO2/therm	WSEC
Off-Site	Natural Gas Energy Density	23600.0	Btu/lbm	2021 ASHRAE Handbook of Fundamentals, 28.3
	Mass Natural Gas/therm	4.2	lbm/therm	Calculation
	Loss Factor	2.4%	%	https://www.pnas.org/doi/10.1073/pnas.1202407109#FN2
	Mass Fugitive CH4 per Therm	0.10	lbm CH4 / therm	Calculation
	Methane GWP	84.0	20-year GWP	https://www.iea.org/reports/methane-tracker-2021/methane-and-climate-change
	Natural Gas GWP	71.4		Assuming 85% Methane Content
	Fugitive Emissions CO2e	7.3	lbm co2e/therm burned on site	Calculation
Total		**19.0**	**lbm co2e / therm**	**Sum of on-site + off-site**

Thanks,

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WAC 51-11C-407031 Tables for Section C407.3.

Table C407.3(1)
Carbon Emissions Factors

Type	CO2e (lb/unit)	Unit
Electricity	0.44	kWh
Natural gas	~~11.7~~19.0	Therm
Oil	19.2	Gallon
Propane	10.5	Gallon
Other[a]	195.00	mmBtu
On-site renewable energy	0.00	

[a] District energy systems may use alternative emissions factors supported by calculations approved by the *code official*.

Table C407.3(2)
Building Performance Factors (BPF) to be used for Compliance with Section C407.3

Building Area Type	Building Performance Factor
Multifamily	0.52
Health care/hospital	0.49
Hotel/motel	0.57
Office	0.50
Restaurant	0.63
Retail	0.43
School	0.33
Warehouse	0.43
All others	0.49

Table C407.3(3)
Site Energy Performance Targets to be used for Compliance with Section C407.3

Building Area Type	~~Building Energy~~ Performance Factor
Multifamily	0.58
Health care/hospital	0.57
Hotel/motel	0.62
Office	0.56
Restaurant	0.70
Retail	0.45
School	0.44
Warehouse	0.49
All others	0.55

Commented [IR1]: A Carbon Emissions Factor of 11.7 lb/therm for natural gas represents only the point-of-use CO2 emissions of complete combustion of natural gas. It does not include any of the carbon emissions associated with production, transmission, leakage, or incomplete combustion of natural gas, and is therefore a vast underestimate of the climate impact of natural gas energy use. The warming effect of fugitive emissions of natural gas during production and distribution is of particular concern, due to the high global warming potential of Methane as a greenhouse gas. Methane has a 20-year global warming potential of 84.0. The 2011 EPA greenhouse gas inventory placed the US natural gas leakage rate at 2.4% from well to city, according to analysis published in the Proceedings of the National Academy of Sciences (Greater focus needed on methane leakage from natural gas infrastructure | PNAS), and recent studies from the Environmental Defense Fund indicate that methane emissions from the US oil and gas industry may be 60% higher than EPA estimates (Major studies reveal 60% more methane emissions | Environmental Defense Fund (edf.org)). Using this 2.4% estimate and the 20-year GWP of methane to reflect the urgency of the climate emergency, a more appropriate carbon emissions factor for natural gas would be 19.2 lbm CO2e/Therm.

Location	Item	Value	Units
On-Site	Emissions from Natural Gas Combust	11.7	lbm CO2/the
Off-Site	Natural Gas Energy Density	23600.0	Btu/lbm
	Mass Natural Gas/therm	4.2	lbm/therm
	Loss Factor	2.4%	%
	Mass Fugitive CH4 per Therm	0.10	lbm CH4 / the
	Methane GWP	84.0	20-year GWP
	Natural Gas GWP	71.4	
	Fugitive Emissions CO2e	7.3	lbm co2e/the
Total		**19.0**	**lbm co2e / th**

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Commented [IR3]: Building and energy performance factors may need to be adjusted to accommodate revised natural gas carbon emissions factor, if accepted.

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Commented [AB2]: Editorial comment